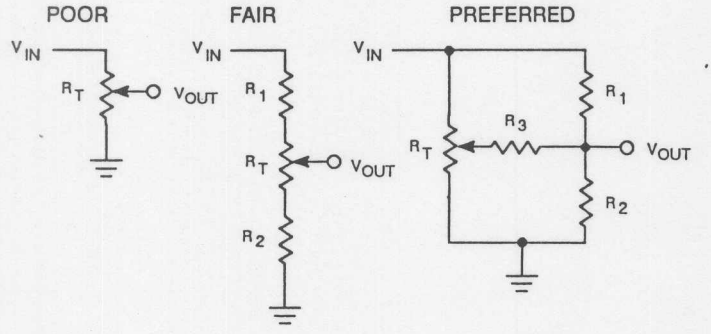
MAXIM ADVANTAGE

GENERAL PURPOSE TRIM TECHNIQUES



This may seem like an elementary subject, but were betting 1/2 page that it isn't. The tighter the tolerances required in a given analog design, the more likly that one or more trims will be needed. From left to right are three progressively improved trim circuits:

POOR: The cheapest, but suffers from poor resolution. Even with high quality multi-turn trimmers, settability rarely is better than 1%. Also the temperature drift of most trim pots will not support precision work with this approach.

FAIR: This is the common "first-pass" at improving drift and resolution. The range of the trimmer is reduced by fixed resistors (hopefully 1%) so the resolution is increased, but a drawback is that it often requires low resistance trimmers (below 100Ω) which are frequently difficult to obtain. Another disadvantage is that absolute value drift in the trim pot will affect the output. On most trimmers, absolute drift has very loose limits compared to ratio drift.

PREFFERED: By adding one more resistor (R3), the problems of the center circuit are eliminated: 1) Large resistance values can be used for the trimmer. 2) Absolute trimmer drift has no effect on the output. 3) The adjustment will have highest resolution in the center of range where it is needed most. 4) The design can start with the optimum fixed resistor divider values, which needed not be changed if the trim is added later.

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ACHIEVING LOW DRIFT PERFORMANCE

Type	R Tempco (ppm/°C) Absolute	Tracking	Manufacturers
Metal Film	25 to 100	–	Mepco, General, Resistance, Corning, TRW
Wire Wound	1 to 20	–	Kelvin, Julie Research, Ultronix
Special Films and Foils	<1 to 20	to 0.5	Vishay, Ultronix, Caddock
Networks	5 to 25	0.5 to 5	Allen Bradley, Caddock, Vishay

Picking a good low drift, low noise op-amp is not all there is to precision analog design, although it's not a bad start.

A critical concern in most precision applications, along with amplifier offset drift and noise, is gain error and drift. The key to minimizing gain drift usually rests with resistor selection. The table lists common precision resistor types and their temperature coefficients.